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FLOOD INSURANCE STUDY

VILLAGE OF CHILO, OHIO

CLERMONT COUNTY

REVISED

AUGUST 15, 1989

Federal Emergency Management Agency

COMMUNITY NUMBER - 390067

NOTICE TO
FLOOD INSURANCE STUDY USERS

Communities participating in the National Flood Insurance Program have established repositories of flood hazard data for floodplain management and flood insurance purposes. This Flood Insurance Study may not contain all data available within the repository. It is advisable to contact the community repository for any additional data.

This publication incorporates revisions to the original Flood Insurance Study. These revisions are presented in Section 3.0.

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Flood Profile

Ohio River Panel 01P

Flood Insurance Rate Map

FLOOD INSURANCE STUDY

VILLAGE OF CHILO,
CLERMONT COUNTY, OHIO

1.0 INTRODUCTION

1.1 Purpose of Study

This Flood Insurance Study investigates the existence and severity of flood hazards in the Village of Chilo, Clermont County, Ohio, and aids in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. This study will be used to convert the Village of Chilo to the regular program of flood insurance by the Federal Insurance Administration (FIA). Local and regional planners will use this study in their efforts to promote sound flood plain management.

In some states or communities, flood plain management criteria or regulations may exist that are more restrictive or comprehensive than those on which these Federally-supported studies are based. These criteria take precedence over the minimum Federal criteria for purposes of regulating development in the flood plain, as set forth in the Code of Federal Regulations at 44 CFR, 60.1 (d). In such cases, however, it shall be understood that the state (or other jurisdictional agency) shall be able to explain these requirements and criteria.

1.2 Authority and Acknowledgements

The source of authority for this Flood Insurance Study is the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973.

The hydrologic and hydraulic analyses for this study were performed by Ralph L. Woolpert Company for the Federal Insurance Administration under Contract No. H-4757. The obtaining and analyses of the Ohio River data were carried out by the Louisville and Huntington Districts of the U.S. Army Corps of Engineers. This study was completed in June 1979.

1.3 Coordination

Streams requiring detailed study were identified at a meeting attended by representatives of the Study Contractor, the FIA, the Ohio Department of Natural Resources (ODNR), and representatives of the Village of Chilo in

April 1978. Results of the hydrologic analysis were coordinated with the U.S. Army Corps of Engineers (COE) for adjacent reaches along the Ohio River. On June 5, 1979, the flood elevations and flood boundaries were reviewed with village officials and were met with their approval.

On December 6, 1979, the results of the work by the Study Contractor were reviewed and accepted at a final coordination meeting attended by representatives of the Study Contractor, the ODNR, the FIA, and community officials.

2.0 AREA STUDIED

2.1 Scope of Study

This Flood Insurance Study covers the incorporated area of the Village of Chilo. The area of study is shown on the Vicinity Map (Figure 1).

The areas studied by detailed methods were selected with priority given to all known flood hazard areas, and areas of projected development or proposed construction for the next five years, through June 1984. The scope and methods of study were proposed to and agreed upon by the FIA and the Village of Chilo.

Floods caused by the overflow of the north bank of the Ohio River, from the downstream corporate limit of Chilo, to the upstream corporate limit, were studied in detail.

2.2 Community Description

The Village of Chilo is located at the Ohio-Kentucky border on the Ohio River in the southwest section of the state, and is 35 miles upstream from the City of Cincinnati. The towns along this stretch of the Ohio River were founded in the early 1800's with Chilo and Moscow being founded in 1816. The town of Susanna originally laid out in 1814, combined with the Town of New Richmond, and was incorporated as the Town of New Richmond in 1828. New Richmond has remained the largest of the riverfront towns in Clermont County to the present time (Reference 1). The census reports indicate only a slight rise in population in Chilo from 174 in 1970 to 191 in 1976 (Reference 2).

The climate of the study region is classified continental with temperatures ranging from an average daily minimum of 27 degrees Fahrenheit (F.) in January to an average daily maximum of 87 degrees F. in July. Weather changes occur every few days from the passing of cold or warm fronts and their associated high and low pressures. The average annual precipitation of the study region is 40.5 inches (Reference 3). Precipitation occurs as rain and snow in the winter and numerous thunderstorms in the spring and summer.

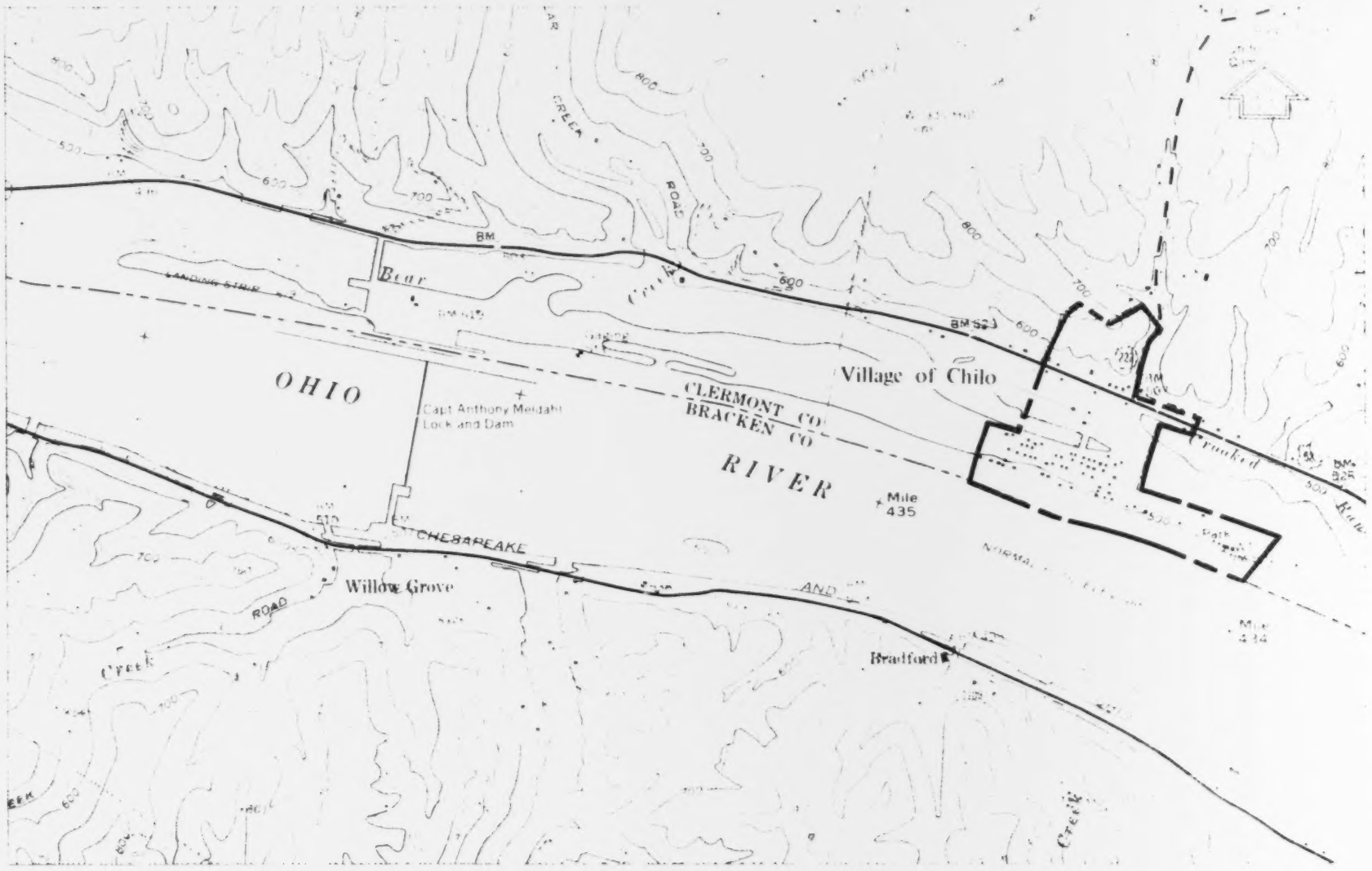


FIGURE 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

VILLAGE OF CHILO, OH
(CLERMONT CO.)

APPROXIMATE SCALE

2000 0 2000 4000 6000 FEET

VICINITY MAP

Geomorphologically, the Village of Chilo lies in the Fairmont-Edenton Soils Area. Soils are shallow with limestone and shale beds on very steep slopes. They are moderately fertile and generally do not need liming, but the shallowness and steepness of the land causes much of it to be unsuited for row crops. Pasture or forestry is the best use for much of the land (Reference 4).

The Ohio River, formed at Pittsburgh, Pennylvania by the junction of the Allegheny and Monongohela Rivers, falls 429 feet in its 981-mile southwesterly course to the Mississippi River at Cairo, Illinois. Major tributaries to the parent stream are: the Little Kanawha, Kanawha, Big Sandy, Licking, Kentucky, Green, Cumberland and Tennessee from the south; and the Beaver, Muskingum, Hocking, Scioto, Little Miami, Great Miami and Wabash from the north.

The majority of the area of Chilo lies between U.S. Route 52 and the Ohio River. Within the flood plain studied, development is limited to residential dwellings. Numerous city streets, as well as U.S. Route 52 and State Route 222, cross the flood plain.

2.3 Principal Flood Problems

Chilo is situated on the north bank of the Ohio River in its broad flat flood plain, approximately 435 stream miles below Pittsburgh, Pennsylvania, and therefore is subject to frequent and severe flooding from that stream. Since 1921, the Ohio River has exceeded flood stage 41 times in the Chilo area (an average of about 8 times in a 10-year period). The 10 highest floods ranged from 7 to 27 feet above flood stage. Present flood stage for the lower pool at the Captain Anthony Meldahl Locks and Dam at River Mile 436.2 is 51.0 feet. The highest recorded flood on the Ohio River in Chilo was that of January 1937. This flood crested at 80.0 feet in Cincinnati, 4 feet above the 500-year flood level. The second highest recorded flood, that of March 1945, was about 11 feet lower at Chilo and had a recurrence interval greater than 100 years. The latest flood of major proportions occurred in March 1965, about one foot lower than the 1945 flood. Flood stage was exceeded in December 1978 and in March 1979. Figures 2 and 3 show the flood heights of the 100- and 500-year floods at two locations in Chilo.

2.4 Flood Protection Measures

There are no natural or man-made flood protection structures, such as levees or floodwalls, that directly affect flooding in the community. However, the system of upstream tributary reservoirs that affect flood heights on the Ohio River at Chilo were taken into consideration for this study. The Meldahl Dam, which regulates the lower stages of the river, has 12 control gates of 100-foot span each between piers and a 310-foot open crest fixed weir. The weirs produce small local swellheads only. As flows increase during floods, the gates are lifted progressively above the river

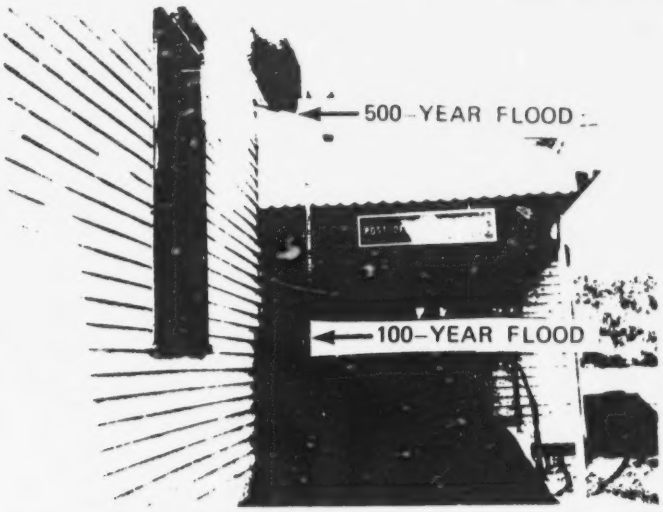


FIGURE 2 - Future flood elevations at the Chilo Post Office (photograph taken February 27, 1979).

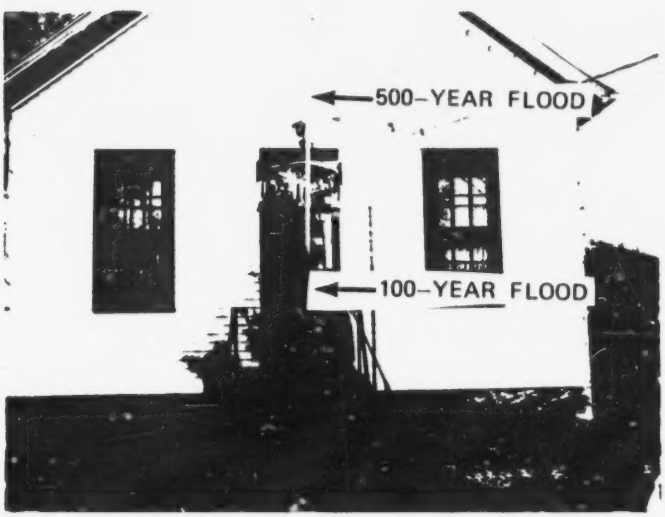


FIGURE 3 - Future flood elevations at the Town Hall (photograph taken February 27, 1979).

crests in a manner that avoids any significant increase in flood stages. At maximum opening, the gates will clear the 1937 flood by approximately five feet (Reference 1). Non-structural measures of flood protection are utilized to aid in the protection of future flood damage. These are in the form of land use regulations adopted from the Code of Federal Regulations which control building within areas that have a high risk of flooding (Reference 5).

3.0 ENGINEERING METHODS

For the flooding sources studied in detail in the community, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this study. Flood events of a magnitude which are expected to be equalled or exceeded once on the average during any 10-, 50-, 100-, or 500-year period (recurrence interval) have been selected as having special significance for flood plain management and for flood insurance premium rates. These events, commonly termed the 10-, 50-, 100-, and 500-year floods, have a 10, 2, 1, and 0.2 percent chance, respectively, of being equalled or exceeded during any year. Although the recurrence interval represents the long term average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than one year are considered. For example, the risk of having a flood which equals or exceeds the 100-year flood (one percent chance of annual occurrence) in any 50-year period is about 40 percent (four in ten), and for any 90-year period, the risk increases to about 60 percent (six in ten). The analyses reported here reflect flooding potentials based on conditions existing in the community at the time of completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.

3.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish the peak discharge-frequency relationships for floods of the selected recurrence intervals for the flooding source studied in detail affecting the community.

Hydrologic analyses were carried out by the COE to establish peak discharge relationships for floods of the selected recurrence intervals for the Ohio River (Reference 6). Discharge-frequency curves at selected USGS gages for the Markland Pool were used to compute the values for the 10-, 50-, 100-, and 500-year floods. Effects of flood protection reservoir systems in the Ohio River basin were taken into account in these computations. The discharges used in this study were computed from the Cincinnati gage records. The analysis followed the standard log-Pearson Type III method as outlined by the U.S. Water Resources Council (Reference 7).

Peak discharges for the 10-, 50-, 100-, and 500-year floods of the flooding source studied in detail in the community are shown in Table 1.

TABLE 1 - SUMMARY OF DISCHARGES

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (SQ MILES)	PEAK DISCHARGE (CFS) 10-YEAR	50-YEAR	100-YEAR	500-YEAR
OHIO RIVER					
At Chilo	71,000	495,500	611,200	658,500	783,400

3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of the streams in the community were carried out to provide estimates of the elevations of the floods of the selected recurrence intervals along the flooding source studied in detail.

Channel roughness coefficients (Manning's "n") for water-surface computations were determined by the COE by computer modeling of backwater curves to match highwater marks for the March 1964 flood (Reference 6). Roughness values for the main channel of the Ohio River were computed to be 0.031, the flood plain roughness values were determined to average 0.055.

Water-surface elevations for the floods of the selected recurrence intervals were computed using the COE HEC-2 step-backwater computer program (Reference 8). Starting water-surface elevations were based on stage-discharge relationships at the Cincinnati, Ohio gage (Reference 6). All profile computations are referenced to the Ohio River Datum at Cincinnati. The flood profiles and elevations above the Captain Anthony Meldahl Dam were determined from stage frequency curves by the Huntington District COE. Flood profiles were drawn showing computed water-surface elevations to an accuracy of 0.5 foot for floods of the selected recurrence intervals (Exhibit 1).

The hydraulic analyses for this study are based only on the effects of unobstructed flow. The flood elevations as shown on the profiles are, therefore, considered valid only if hydraulic structures, in general, remain unobstructed and if channel and overbank conditions remain essentially the same as ascertained during this study.

All elevations are referenced from National Geodetic Vertical Datum of 1929 (NGVD); elevation reference marks used in the study are shown on the maps.

4.0 FLOOD PLAIN MANAGEMENT APPLICATIONS

The National Flood Insurance Program encourages state and local governments to adopt sound flood plain management programs. Therefore, each Flood Insurance Study includes a flood boundary map designed to assist communities in developing sound flood plain management measures.

4.1 Flood Boundaries

In order to provide a national standard without regional discrimination, the 100-year flood has been adopted by the FIA as the base flood for purposes of flood plain management measures. The 500-year flood is employed to indicate additional areas of flood risk in the community. For each stream studied in detail, the boundaries of the 100- and 500-year floods have been delineated using topographic maps at a scale of 1:9600, with a contour interval of 20 feet (Reference 9).

Flood boundaries are indicated on the Flood Insurance Rate Map (Panel 0005). On this map, the 100-year flood boundary corresponds to the boundary of the areas of special flood hazards (Zone A22); and the 500-year flood boundary corresponds to the boundary of areas of moderate flood hazards (Zone B). Small areas within the flood boundaries may lie above the flood elevations and, therefore, not be subject to flooding; owing to lack of detailed topographical information or to limitations of the map scale, such areas are not shown. In cases where the 100-year and the 500-year flood boundaries are close together, only the 100-year boundary has been shown.

4.2 Floodways

Encroachment on flood plains, such as artificial fill, reduces the flood-carrying capacity, increases the flood heights of streams, and increases flood hazards in areas beyond the encroachment itself. One aspect of flood plain management involves balancing the economic gain from flood plain development against the resulting increase in flood hazard. For purposes of the National Flood Insurance Program, the concept of a floodway is used as a tool to assist local communities in this aspect of flood plain management. Under this concept, the area of the 100-year flood is divided into a floodway and a floodway fringe. The floodway is the channel of a stream plus any adjacent flood plain areas that must be kept free of encroachment in order that the 100-year flood may be carried without substantial increases in flood heights. Minimum standards of the FIA limit such increases in flood heights to 1.0 foot, provided that hazardous velocities are not produced.

The floodway is based on conveyance reduction from each side of the flood plain, with the cross section as the primary input for this computation. No cross sections are in the study area and, therefore, no floodway was computed for the Ohio River in Chilo.

In cases where the boundaries of the floodway and the 100-year flood are either close together or collinear, only the floodway boundary has been shown.

The area between the floodway and the boundary of the 100-year flood is termed the floodway fringe. The floodway fringe thus encompasses the portion of the flood plain that could be completely obstructed without increasing the water-surface elevation of the 100-year flood more than 1.0 foot at any point. Typical relationships between the floodway and the floodway fringe and their significance to flood plain development are shown in Figure 4.

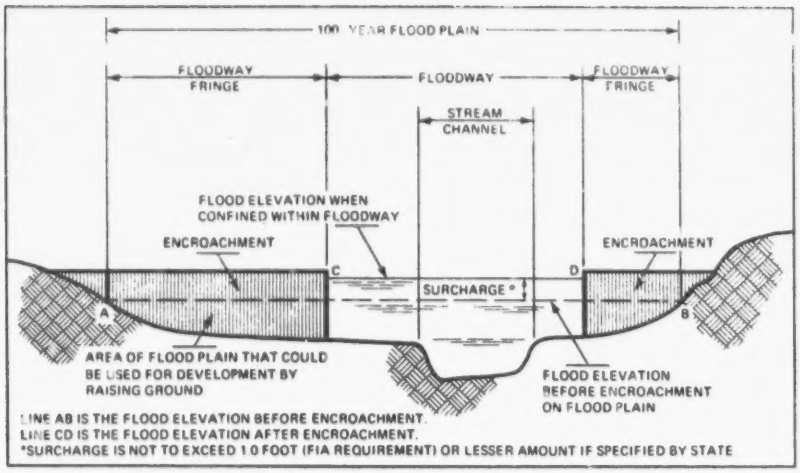

100 YEAR FLOOD PLAIN
FLOODWAY FRINGE
FLOODWAY
FLOODWAY FRINGE
STREAM CHANNEL
FLOOD ELEVATION WHEN CONFINED WITHIN FLOODWAY
ENCROACHMENT
ENCROACHMENT
C
D
SURCHARGE *
A
B
AREA OF FLOOD PLAIN THAT COULD BE USED FOR DEVELOPMENT BY RAISING GROUND
FLOOD ELEVATION BEFORE ENCROACHMENT ON FLOOD PLAIN
LINE AB IS THE FLOOD ELEVATION BEFORE ENCROACHMENT.
LINE CD IS THE FLOOD ELEVATION AFTER ENCROACHMENT.
*SURCHARGE IS NOT TO EXCEED 1.0 FOOT (FIA REQUIREMENT) OR LESSER AMOUNT IF SPECIFIED BY STATE

FIGURE 4 - Floodway Schematic

5.0 INSURANCE APPLICATION

In order to establish actuarial insurance rates, the FIA has developed a process to transform the data from the engineering study into flood insurance criteria. This process includes the determination of reaches, Flood Hazard Factors (FHF), and flood insurance zone designations for each flooding source affecting the Village of Chilo.

5.1 Reach Determinations

Reaches are defined as lengths of watercourses having relatively the same flood hazard, based on the average weighted difference in water-surface elevations between the 10- and 100-year floods. This difference does not have a variation greater than that indicated in the following table for more than 20 percent of the reach.

Average Difference Between 10- and 100-year Floods	Variation
Less than 2 feet	0.5 foot
2 to 7 feet	1.0 foot
7.1 to 12 feet	2.0 feet
More than 12 feet	3.0 feet

The locations of the reaches determined for the Village of Chilo are shown on the Flood Profiles and are summarized in the Flood Insurance Zone Data Table (Table 2).

5.2 Flood Hazard Factors

The FHF is used to correlate flood information with insurance rate tables. Correlations between property damage from floods and their FHFs are used to set actuarial insurance premium rate tables based on FHFs from 005 to 200.

The FHF for a reach is the average weighted difference between the 10- and 100-year flood water-surface elevations expressed to the nearest 0.5 foot, and shown as a three-digit code. For example, if the difference between water-surface elevations of the 10- and 100-year floods is 0.7 foot, the FHF is 005; if the difference is 1.4 feet, the FHF is 015; if the difference is 5.0 feet, the FHF is 050. When the difference between the 10- and 100-year water-surface elevations is greater than 10.0 feet, accuracy for the FHF is to the nearest foot.

5.3 Flood Insurance Zones

After the determination of reaches and their respective FHFs, the entire incorporated area of the Village of Chilo was divided into zones, each having a specific flood potential or hazard. Each zone was assigned one of the following flood insurance zone designations:

Zone A21:	Special Flood Hazard Areas inundated by the 100-year flood, determined by detailed methods; base flood elevations are shown, and zones subdivided according to FHF.
Zone B:	Areas between the Special Flood Hazard Area and the limits of the 500-year flood, including areas of the 500-year flood plain that are protected from the 100-year flood by dike, levee, or other water control structure; or areas subject to certain types of 100-year shallow flooding where depths are less than 1.0 foot; and areas subject to 100-year flooding from sources with drainage areas less than 1 square mile. Zone B is not subdivided.
Zone C:	Areas of minimal flooding.

Table 2, "Flood Insurance Zone Data," summarizes the flood elevation differences, FHFs, flood insurance zones, and base flood elevations for each flooding source studied in detail in the community.

5.4 Flood Insurance Rate Map Description

The Flood Insurance Rate Map for the Village of Chilo is, for insurance purposes, the principal result of the Flood Insurance Study. This map contains the official delineation of flood insurance zones and base flood elevation lines. Base flood elevation lines show the locations of the expected whole-foot water-surface elevations of the base (100-year) flood. This map is developed in accordance with the latest flood insurance map preparation guidelines published by the FIA.

6.0 OTHER STUDIES

A Flood Insurance Study for the unincorporated areas of Clermont County which surround the Village of Chilo on the Ohio side of the Ohio River will match exactly the Chilo study (Reference 10). A Flood Plain Information Report for the Ohio River in Clermont County, Ohio, was published in December 1968 (Reference 1). This report, however, involved different land-use conditions, so the profiles do not agree.

A Flood Hazard Boundary Map has been published by the Federal Insurance Administration (Reference 11). The differences between the Flood Hazard Boundary Map and this study are justified due to the more detailed nature of this Flood Insurance Study.

This report either supersedes or is compatible with all previous studies published on streams studied in this report and should be considered authoritative for the purposes of the National Flood Insurance Program.

7.0 LOCATION OF DATA

Survey, hydrologic, hydraulic and other pertinent data used in this study can be obtained by contacting the Insurance and Mitigation Division, Federal Emergency Management Agency, One North Dearborn Street, Chicago, Illinois 60602.

FLOODING SOURCE	PANEL[1]	ELEVATION DIFFERENCE[2] BETWEEN 1.0% (100-YEAR) FLOOD AND			FLOOD HAZARD FACTOR	ZONE	BASE FLOOD ELEVATION[3] (NGVD)
		10% (10-YEAR)	2% (50-YEAR)	0.2% (500-YEAR)			
OHIO RIVER							
REACH 1	0005	-11.0	-3.1	8.3	110	A21	VARIES-SEE MAP

[1]FLOOD INSURANCE RATE MAP PANEL
[2]WEIGHTED AVERAGE
[3]ROUNDED TO NEAREST FOOT

REVISED 8/15/89

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

VILLAGE OF CHILO, OH
(CLERMONT CO.)

FLOOD INSURANCE ZONE DATA

OHIO RIVER

8.0 REFERENCES AND BIBLIOGRAPHY

1. U.S. Army Corps of Engineers, Louisville District, Flood Plain Information, Ohio River, Clermont County, Ohio, December 1968.

2. The Clermont County Planning Commission, A Comprehensive Housing Element for Clermont County, Ohio, June 1977.

3. Ohio Department of Natural Resources, Division of Water, Bulletin No. 45, Floods in Ohio, Magnitude and Frequency, 1977.

4. ----------, Bulletin No. 32, Floods in Ohio, Magnitude and Frequency, 1959.

5. U.S. Department of Housing and Urban Development, Federal Insurance Administration, Code of Federal Regulations, Title 24, Chapter 10, Parts 1910.3A and 3B, Federal Register, Volume 41, No. 207, Revision, 1976.

6. U.S. Army Corps of Engineers, Louisville District, Basic Cross Section and Hydrologic Data on the Ohio River, (unpublished).

7. U.S. Water Resources Council, Hydrology Committee, Bulletin No. 17, Guidelines For Determining Flood Flow Frequency, March 1976.

8. U.S. Army Corps of Engineers, Hydrologic Enigneering Center, Computer Program, 723-X6-L202A, HEC-2 Water-Surface Profiles, Davis, California, (updated) December 1968.

9. U.S. Geological Survey, 7.5 Minute Series Topographic Maps, Scale 1:9600, Contour Interval 20 feet: Moscow, Ohio, 1976.

10. Federal Emergency Management Agency, Federal Insurance Administration, Flood Insurance Study, Clermont County, Unincorporated Areas, Ohio, (in progress).

11. U.S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Hazard Boundary Map, Village of Chilo, Ohio, July 1976.

U.S. Army Corps of Engineers, Louisville District, Flood Plain Information, Ohio River, Hamilton County, Ohio, December 1968.

9.0 REVISIONS DESCRIPTION

This section has been added to provide information regarding significant revisions made since the original Flood Insurance Study was printed. Future revisions may be made that do not result in the republishing of the Flood Insurance Study report. To assure that any user is aware of all revisions, it is advisable to contact the community repository of flood hazard data located at the Community Building, 310 Washington Street, Chilo, Ohio.

9.1 First Revision (Revised August 15, 1989)

a. Acknowledgments

The hydraulic analyses for this Revisions Description were performed by the U.S. Army Corps of Engineers (COE), Ohio River Division. The Federal Emergency Management Agency reviewed and accepted these data for purposes of this revision.

b. Scope

The base flood elevations along the entire reach of the Ohio River, which flows along the southern corporate limits of the village, were revised based on a report published by the COE, Ohio River Division, titled "Profiles on the Ohio River" (Reference 12).

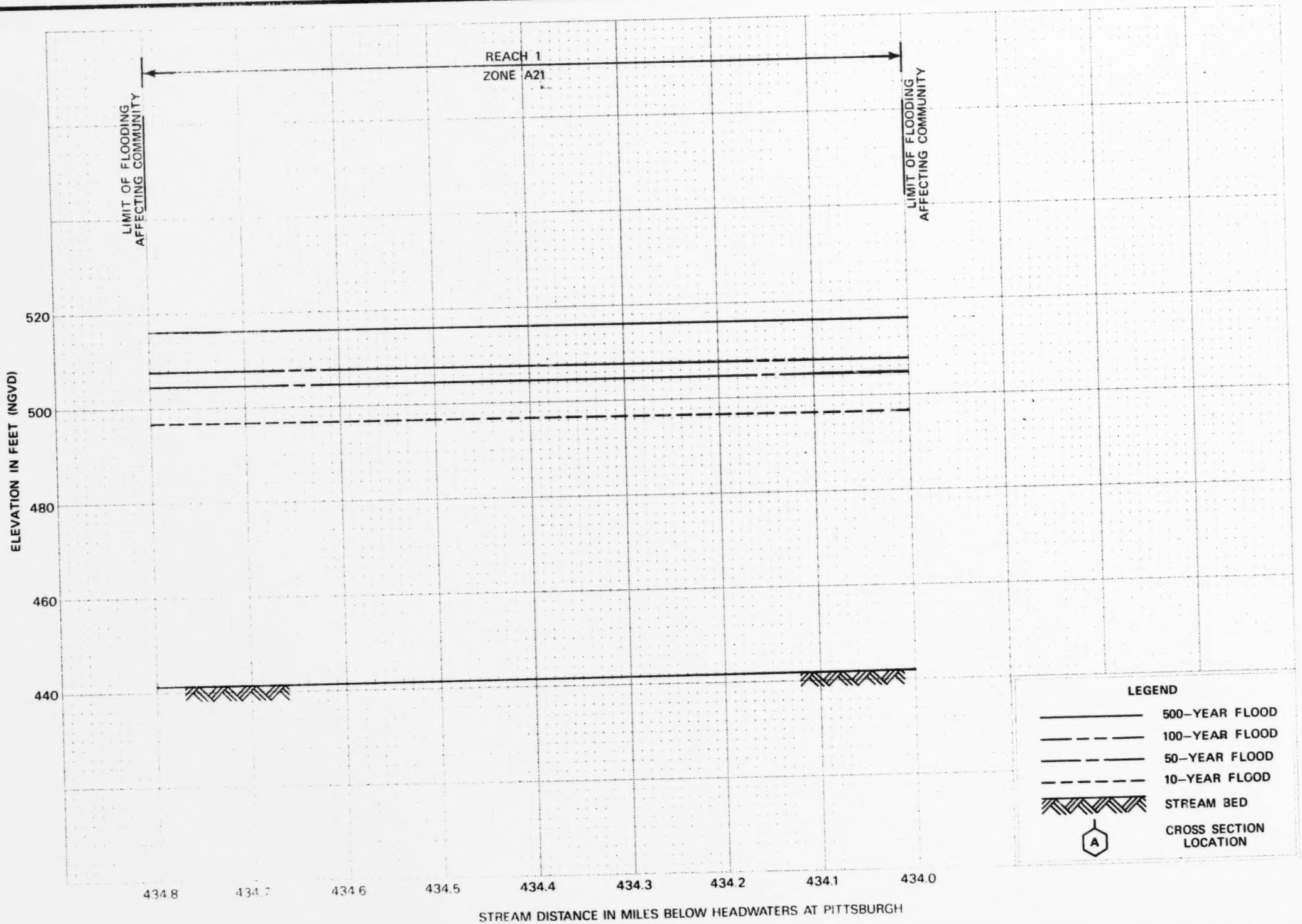
c. Other Studies

The Flood Insurance Study published for Clermont County, Ohio (Reference 13) is being revised in conjunction with this revision and is in agreement with this revised study.

d. References and Bibliography

12. U.S. Army Corps of Engineers, Ohio River Division, Profiles on the Ohio River, revised March 1983.

13. Federal Emergency Management Agency, Flood Insurance Study, Clermont County, Unincorporated Areas, Ohio, April 1981, revised August 1985, second revision in progress.



FLOOD PROFILES

OHIO RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

VILLAGE OF CHILO, OH
(CLERMONT CO.)

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